GHG Emissions Forecast and Wedge Analysis for City of Milwaukee

Prepared by ICLEI USA
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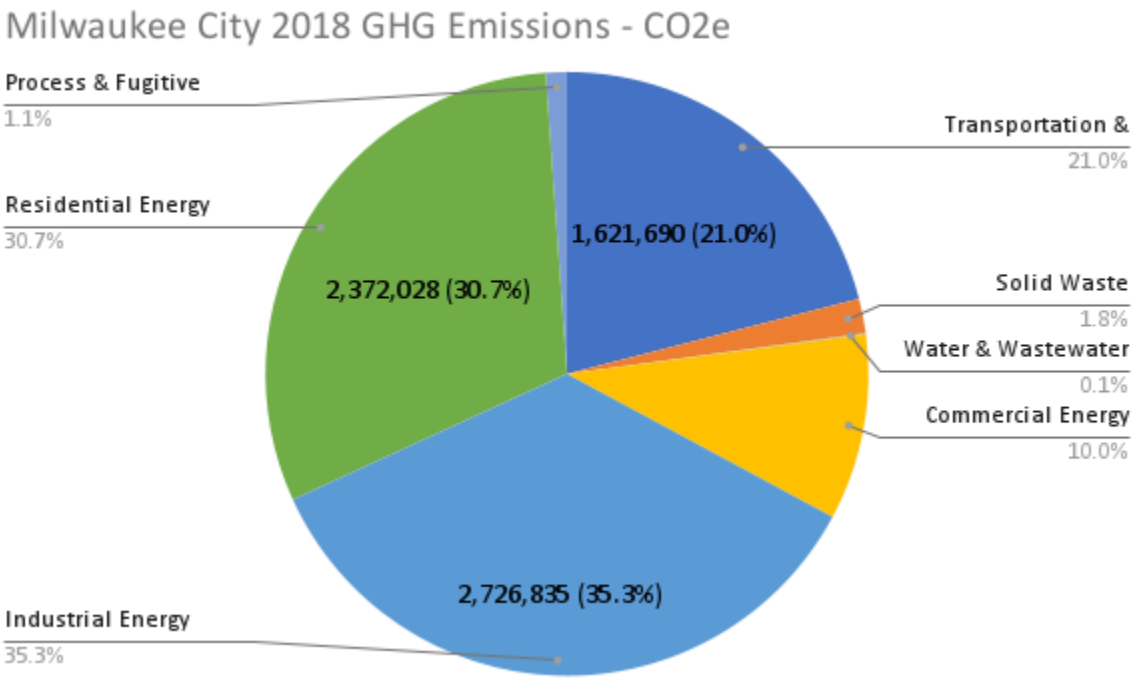
2018 Annual GHG Emissions (Original Analysis)



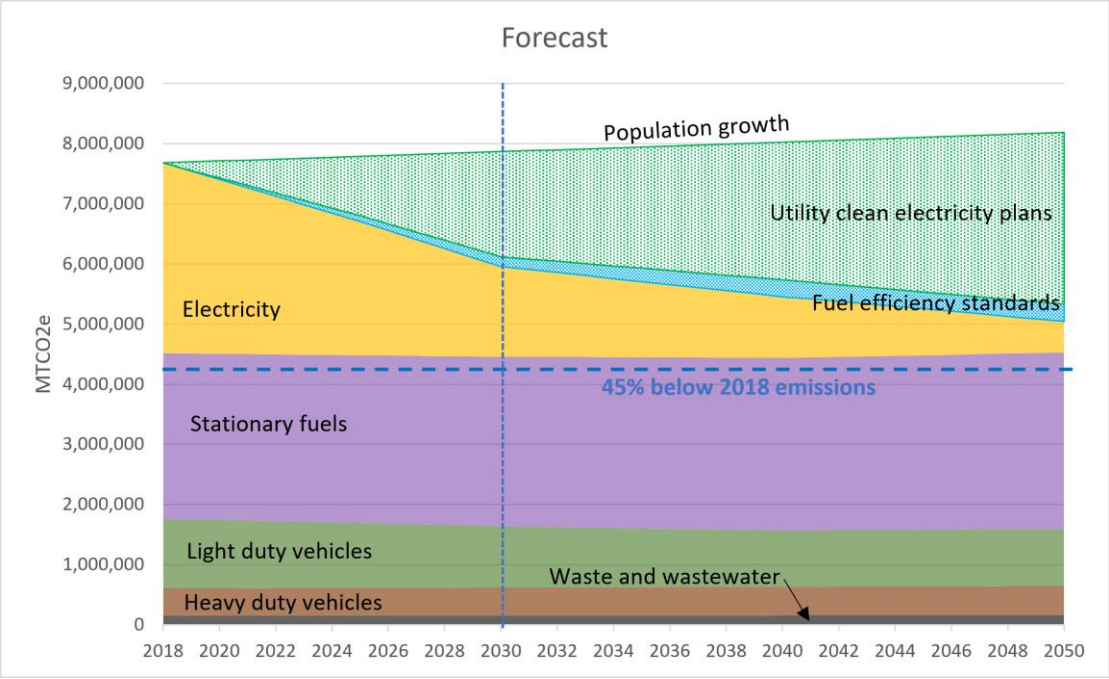
City of Milwaukee's Greenhouse Gas Forecast & Planning Scenarios

The City of Milwaukee's most recent communitywide greenhouse gas (GHG) inventory includes emissions from activities and sources that took place within the City of Milwaukee during the 2018

calendar year. Using the 2018 GHG inventory as a baseline, ICLEI prepared a "business-as-usual" forecast and recommended potential reduction strategies.

Business-As-Usual (BAU) Forecast

The BAU forecast (pictured below) is a projection of emissions through the year 2050 based on estimated population growth[1] (uppermost line) , changes in automotive fuel efficiency standards[2], and electricity grid decarbonization that is part of [WE Energies stated goal of 70% emissions reductions by 2030](). The BAU was adjusted in 2021 to include new goals from WE Energies committing to a 60% reduction in carbon emissions at its electric plants by 2025, relative to 2005 levels, and an 80% drop by 2030, with the utility having pledged to become net carbon neutral by 2050.The automotive fuel efficiency standards and decreases in electricity grid carbon intensity are the dotted shades and indicate the respective decreases by 2050. However, of the remaining emissions, natural gas for thermal heating and industrial process and transportation internal combustion engine emissions continue to contribute large portions of emissions. Without any additional emissions reductions, Milwaukee would fall short of its 45% reduction by 2030 goal. As reported in Milwaukee's Greenhouse Gas Inventory Report, a better understanding of the breakout of commercial and industrial sector natural gas and electricity related emissions will be critical to appropriately identifying potential emissions reductions from building electrification and energy efficiency.



[1] Wisconsin State, County, and Municipal 2040 Population Projections

[2] Based on the current Trump Administration Fuel standards established by the National Highway Traffic Safety Administration (Subject to change).

Review of Residential, Commercial, Industrial Sectors

During the completion and analysis of Milwaukee's 2018 GHG Inventory, it was noted that the apportioning of data for Commercial and Industrial was likely skewed heavily to Industrial. We Energies considered any account with demand rates as Industrial, though it is common for traditional commercial "businesses" to also have demand charges. In order to correctly model impacts of policies that would impact emissions in the commercial sector, ICLEI was provided with more detailed Assessor data. After reviewing the assessor data and the Department of Energy's SLOPE data and researching the classifications, ICLEI proposed the following numbers for Commercial Buildings in our wedge analysis:

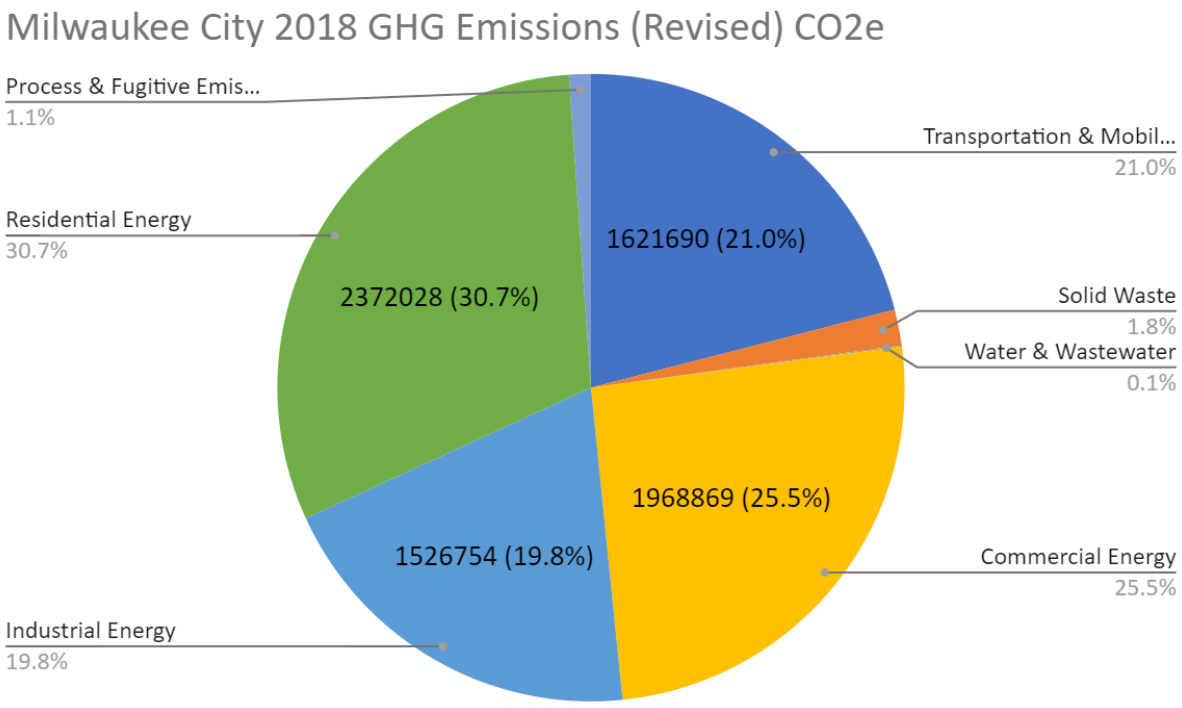
WE Energies' breakout indicated 474,514,225 kWh of Commercial Electricity and 2,971,630,877 of Industrial for a total of 3,446,145,102 kWh. Also, Residential was provided by WE Energies to be 1,901,089,585 kWh.

- Using Assessor's Data there is 241,429,156 sq ft of Commercial Space in Milwaukee ranging from 300 sq ft - >500,000 sq ft , of which 66,509,095 is deemed mercantile apartments, or what might be considered multifamily. This multifamily estimate matches well with the SLOPE data that determined there was 62,456,954 sq ft of multi-family in Milwaukee.
- Applying the 2012 CBECS average energy use intensity for the different sizes of commercial buildings, we estimate 2,500,675,312 kWh of commercial electricity being consumed in Milwaukee's commercial buildings and 964,381,878 kWh in Multi-family buildings.
    - With additional analysis and comparing Milwaukee's total residential consumption to Minneapolis' residential consumption,it was assumed that units of large multifamily are likely being billed as residential while the common space is billed under commercial/industrial from WE Energies.
    - ICLEI proposed to use CBEC's estimates to determine a better estimate of commercial and assign industrial the remainder of WE Energies Commercial and Industrial Total. ICLEI also propose that the Multifamily consumption be broken out and removed from the residential provided by WE Energies
    - Adding a Multi-family bucket may prove essential in modelling as large multifamily properties may have some of their space fall under commercial strategies like Benchmarking or other improvements, while the majority of space would fall under residential strategies aimed at changing behavior.

Commercial Energy Estimates			
Sector (sq ft)	EUI	Sq Ft (total)	Total Elect kWh
Comm 300 -25,000	13.9	48,355,614	672,143,035

Comm 25-50	11.4	17,948,106	204,608,408
Comm 50 -100	13.9	43,119,946	599,367,247
Comm 100 - 200	14.6	24,514,783	357,915,832
Comm 200 - 500	14.3	23,459,060	335,464,558
Comm >500	18.9	17,522,552	331,176,233
Total		174,920,061	2,500,675,312
Multi Family Total	14.5	66,509,095	964,381,878
Grand Total		241,429,156	3,465,057,190

	Old kWh	New kWh
Commercial	474,514,225	2,500,675,312
Industrial	2,971,630,877	945,469,790
Residential	1,901,089,585	936,707,708
Multi-family	NA	964,381,878
Total	5,347,234,687	5,347,234,687



Stationary Energy

Most emissions come from commercial/industrial energy and residential energy sectors as evident the emissions from stationary fuel (natural gas for heating and process energy) and electricity. Even with planned lower carbon electricity from WE Energies, stationary fuels will remain a large contributor to Milwaukee's overall emissions footprint. It is imperative to pursue mitigation strategies that address commercial and residential-specific buildings along with general mitigation strategies for all building types – with a full understanding of the impact of electrification of buildings to an electric grid that will still contain some carbon-based generation.

ICLEI suggests improving energy efficiency of all building types through a series of strategies. Energy Audits, specifically ASHRAE Level II mandatory audits for properties larger than 25,000 ft^2, help buildings identify EE opportunities and benchmark improvements. Buildings larger than 25,000 ft^2 can also benefit retro-commissioning and lighting upgrade requirements. For the residential sector, weatherization is beneficial in reducing emissions, especially in cold climates.

In conjunction with energy efficiency improvements, it is helpful to establish energy benchmarking and disclosure programs. Benchmarking programs at the local level are an affordable means to help measure and compare energy performance, provide transparency, and maintain accountability.

Retrofit programs will help address residential and commercial energy efficiency. Building on Milwaukee's successful Me^2 program can help ensure efficiency in homes is well established prior to developing renewable and electrification options for homeowners. Likewise, enhancing and expanding the Commercial Buildings Better Building Challenge in Milwaukee will provide the needed engagement points with Building Owners and Operators to drive down energy use in one of the largest sectors of emissions. Reinforcing these programs through the local government will create the support necessary to spur residential and commercial momentum.

Improving, requiring, and enforcing energy codes for new and existing buildings is the best way to ensure that building owners are taking sufficient steps toward reducing emissions. Understanding that Codes are set at the state level, ICLEI still suggests advocating for updated building codes to match the most recent IECC Codes. Process improvements to the review and adoption of energy codes may help promote incorporating the energy efficiency benefits of updated codes. This assumes that all new buildings are subject to the most recent IECC upgrades and buildings with substantial renovations trigger IECC upgrades. It is also necessary to provide education while enforcing code compliance.

Other strategies to pursue are: establishing SmartRegs for rental properties to promote and require basic EE standards, improving codes gradually until net-zero (targeting net-zero for all new buildings), planning for natural gas thermal heating switching to low or no carbon fuels, institute a city-wide carbon user fee, and set goals to gradually increase renewable energy sources to 100%. This can include purchasing 100% Bundled Renewable Energy Credits to meet a small portion of the goal.

To model potential impacts in the Stationary Energy Sector, ICLEI applied the following assumptions:

- 2021 IECC Building Code applied to 0.2% annual growth plus 1% annual turnover of building stock with 30% residential energy savings, 20% commercial, compared to BAU
- 2.4% annual savings for commercial buildings over 25,000 sq ft for 3 years (7.2% total & 90% compliance rate)
- 30% of new commercial space is no natural gas and 20% less electricity compared to BAU
- Residential:
    - 4,000 units/year for 10 years (40,000 units total, about 20% of 1-4 unit housing in city)
    - Per unit savings of 1160 kWh, 185 therms (13% savings for electricity, 20% for gas)
    - Savings from 2018 assessment of Wisconsin Home Energy Plus Program
    - 500 net-zero energy homes per year

Transportation

The third-largest contributor to community-wide emissions is transportation (21%). Like any urban center, most emissions come from on-road transportation. The following mitigation strategies represent fuel switching, mode-shift, or personal vehicle discouragement, all of which directly or indirectly reduce on-road transportation emissions.

Implementing a city-wide EV strategy is a critical step in reducing emissions, as well as sparking EV adoption. An EV strategy often consists of providing EV incentives to promote adoption, expanding EV charging infrastructure to support adoption, converting transit fleets and municipal fleets, and establishing EV charging building ordinances.

While it's imperative to convert on-road vehicles to cleaner fuel sources such as electricity, it's more essential to reduce personal vehicle use. Personal vehicle discouragement takes many forms, but some strategies are more appropriate for a city like Milwaukee. Parking changes such as dynamic or increased parking fees, or parking reutilization often encourage more efficient forms of transportation that focus on moving people and not just cars. Adjusting parking minimums/establishing maximum parking standards for new construction reduces investment in parking, which encourages more efficient transportation.

Personal vehicle use is common for many cities, but as local economies struggle, deterring people from using their vehicles can produce inverse economic impacts. However, this issue can be resolved by providing robust transportation alternatives. Having abundant and efficient public transportation is essential and can be accomplished by supporting the SEWRPC's Vision 2050 plan. It is also imperative to pursue transit-oriented redevelopment. TOD encourages the construction of transit hubs and housing development around transit hubs, which not only promotes public transit use but reduces personal vehicle emissions as residents have improved access to public transit.

Along with public transit, promoting alternative mode shifts by establishing pedestrian zones in high pedestrian-traffic areas, increasing bike-share programs, and improving cycling access is extremely important in a medium-sized city like Milwaukee. When this alternative transportation is available, cycle and walk to workdays are entertaining ways to promote further mode shifts.

To model the potential impacts in the Transportation Sector ICLEI utilized the following assumptions:

- 20% per-capita Vehicle Miles Travelled (VMT) reduction in 2030
- 30% per-capita VMT reduction in 2050
- 14% reduction in fuel per mile in 2030 for light duty vehicles
- 23% reduction in fuel per mile in 2040 (constant after 2040)
- No change to heavy duty vehicle efficiency
- 50% of new light duty vehicles electric in 2030
- 30% of new heavy duty vehicles electric in 2030
- 100% of new vehicles electric in 2050